

# Deployable Pathogen Diagnostic System



## Sandia National Laboratories

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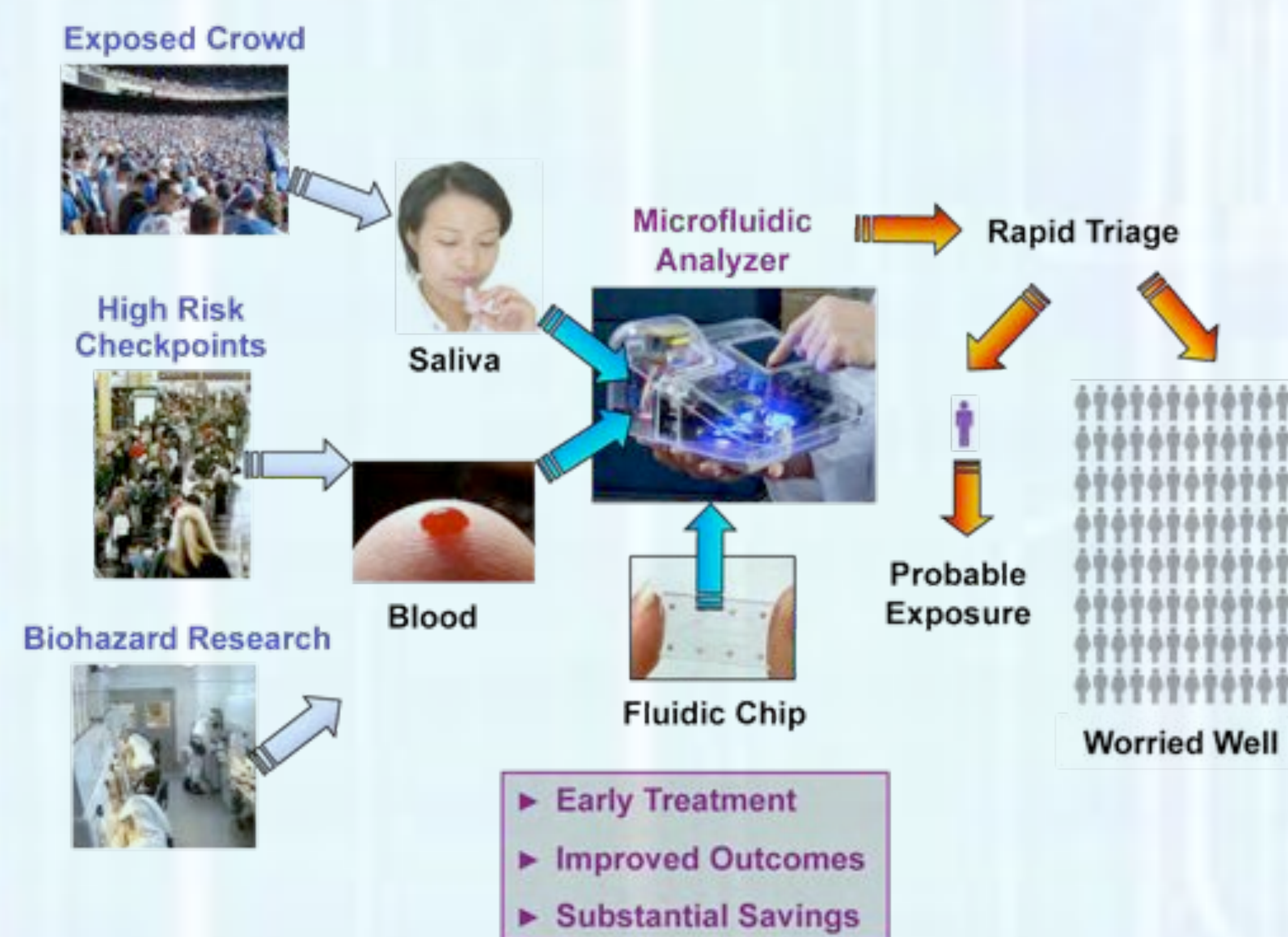
### Problem

- Graham/Talent Report, Dec 2008:
  - "Terrorists are more likely to obtain and use a biological WMD than a nuclear weapon..."
  - "...without aggressive action it is >50% likely a terrorist attack with WMD will occur within the next 5 years..."
  - "...greater preparedness is needed to reduce the effects of a biological strike...improved capabilities for detecting disease agents and treating those who may be exposed..."
- Disaster mitigation of outbreak/exposure scenarios is a key concern.
  - Health-care system not equipped for such scenarios
  - Substantial savings in \$\$\$ and lives with early triaging and intervention
- Field-deployable medical diagnostics of infection are needed:
  - No existing devices satisfy exposure/outbreak scenarios (rapid, portable, sensitive, high-throughput, easy to use, low-cost)
  - Early detection enables effective treatment and correct administration of therapeutics

### Approach

- Current Sandia platform technology meets demands but is not deployable
- Systems engineering of a deployable analyzer will meet the need for disaster mitigation
  - Design system for deployment at collaborating labs and field assessment
    - Satisfy key criteria for speed, ease of use, analytical sensitivity and specificity
  - Test and refine system in Sandia BSL2 facilities and collaborating institution engaged in priority pathogen research (UTMB)

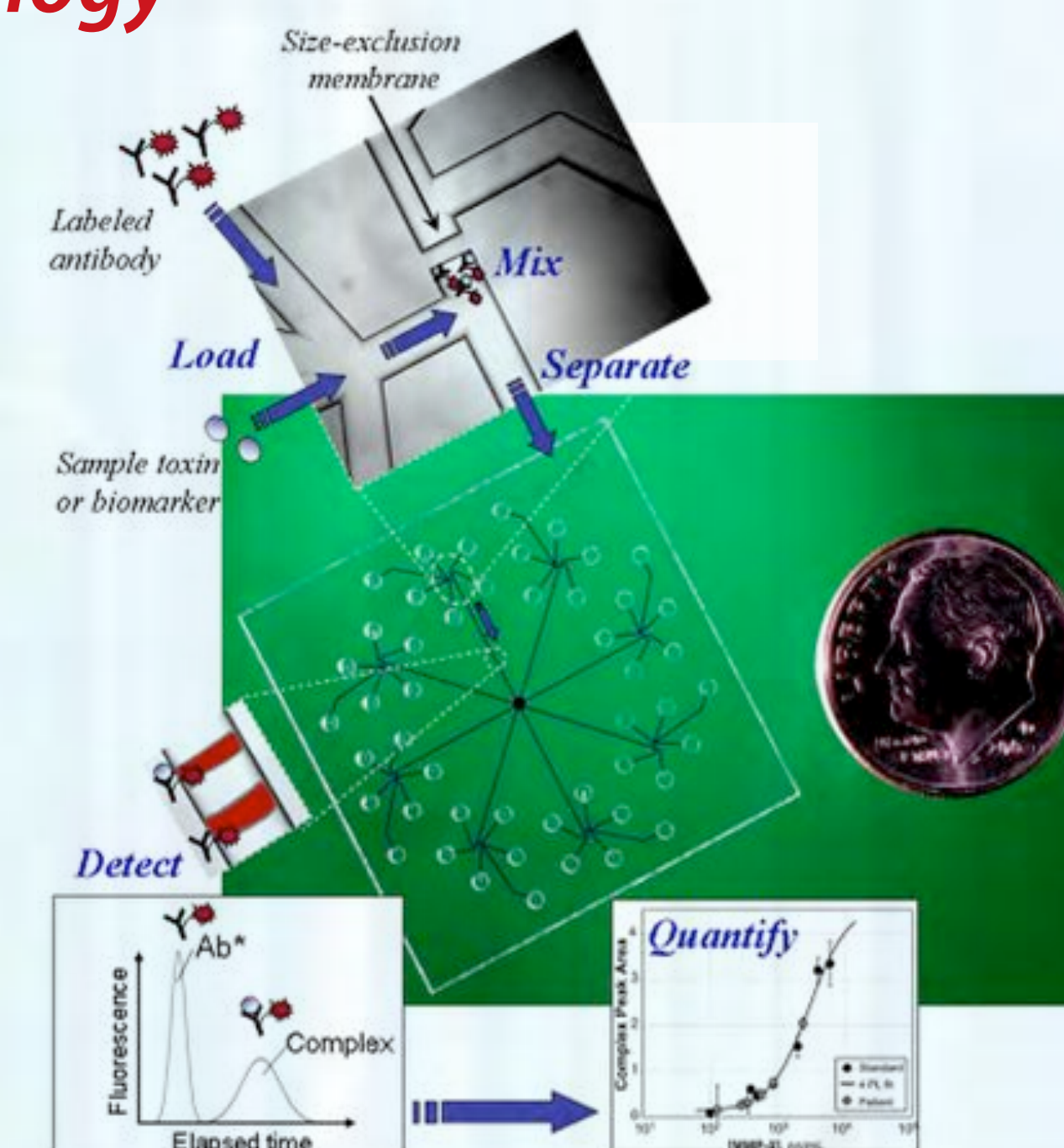
### Disaster Mitigation Approach



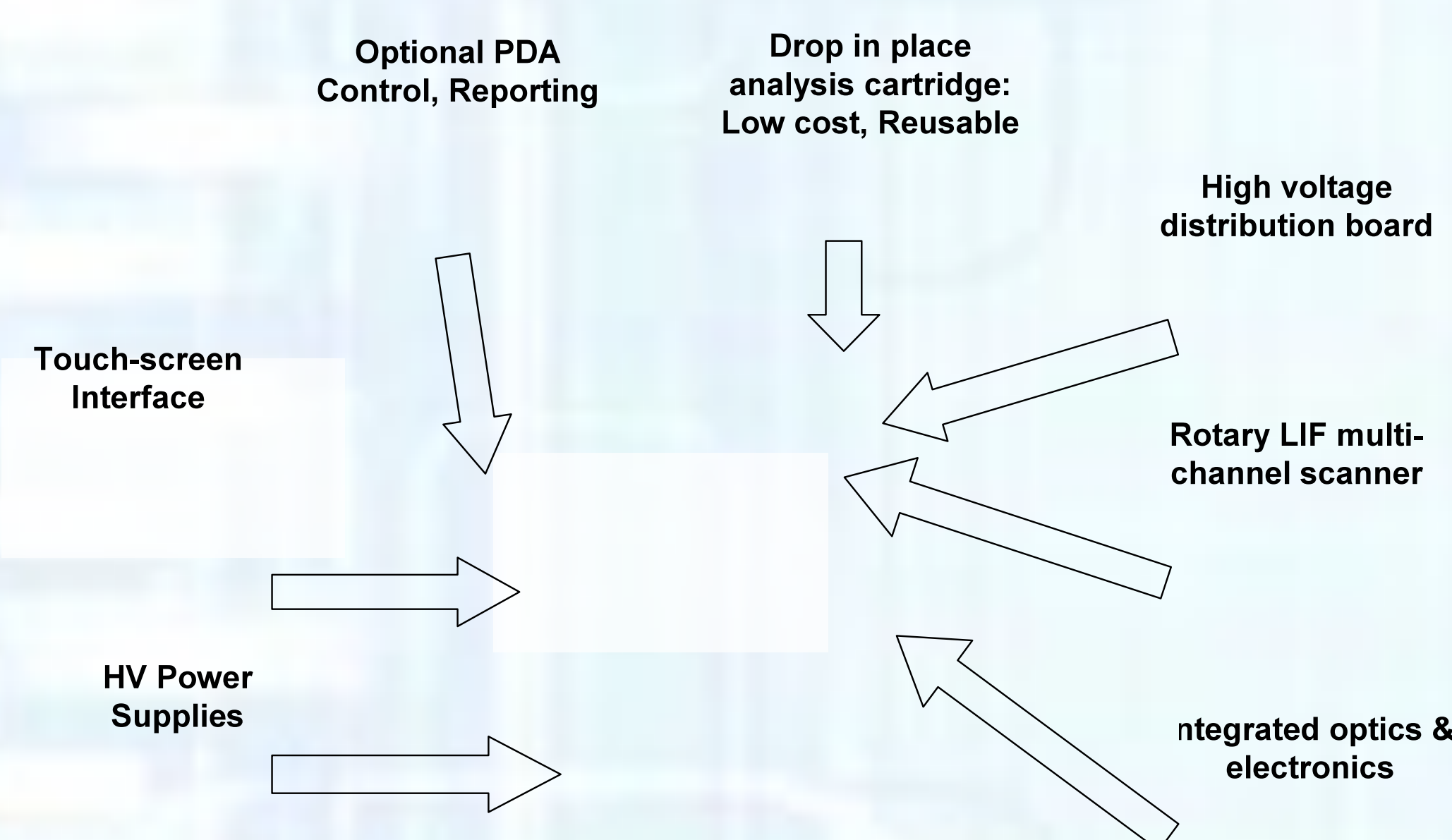
### Results

#### Lab on a Chip Technology

- On-chip Gel-shift affinity assay
- Integrated On-chip processing:
  - Mix sample with labeled probe
  - Preconcentrate sample
  - Buffer exchange
- Rapid, 30–150 second separations
- Solution Phase:
  - No immobilization
  - Short incubation time
  - No rinsing or adsorbed background
- Parallel processing, multi-analyte
- Clean baselines and easily interpreted electropherograms



#### Modular System Concept



#### Notable Successes

- Feature publication in Lab on a Chip, Dec 2008:
- Novel high-voltage multiplexing electronic board and module
- Next-generation fluidics routing and low-cost cartridge design using snap together moldable parts
- Novel sliding valve technology for reagent isolation
- Robust, modular system architecture
- Ongoing discussions with a wait-list of potential users

### Significance

#### Potential impact extends beyond priority pathogen diagnostics

- Bolsters internal R&D efforts
  - Modular BSL-2 compatible microfluidics workstation
- Many potential users and application areas identified
  - UTMB, WRCE (BSL2-4),
  - NBACC (BoNT assays, forensics)
  - NASA (Astronaut health, SBIR, partnership with AM Biotech)
  - NIH, DTRA (traumatic brain injury, with P2D Biosciences)
  - NIH/NIAID, BAARDA (Toxin diagnostics, Radiation exposure)
  - LRRI (toxin diagnostics, animal models)